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MECHANOTHERAPY.*

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I AM keenly aware of the honor your Association has done me as a layman in asking me to address you on Mechanotherapy. The latter is a term rarely heard technically in Canada, Functional Re-education being preferred, and for the purposes of this paper I interpret it broadly as the use of appliances to assist in the restoration of functions through supervised active effort.

It is a particular pleasure to speak in Washington and in the presence of the physician who started me in this reclamation work as a form of applied psychology. In 1916, Dr. Franz was kind enough not only to show me but to introduce me to a small clinic in St. Elizabeth's for the re-education of physical functions and of mental disabilities associated therewith.

During the past one and one-half years in a clinic at Toronto under the Military Hospitals Commission of Canada these principles have been applied and elaborated upon some three hundred and fifty returned military patients, chiefly of widely assorted orthopedic types. From the beginning, the want of a definite technic and of implements compelled our staff to experiment in methods of utilizing exercise, and for that purpose to procure means of building assistive appliances. We do not begrudge this handicap in equipment because of the opportunity it gave to test clinically our own and others' designs and to incorporate all the promising suggestions, comment and criticism that reached us. A visit last fall to treatment departments in Britain and northern and central France led me to modify details, but not the principles we had been following. It is these principles, illustrated by slides, I would submit for discussion. I believe that they represent only a beginning in what the future holds in this field of therapeutic practice, and in the unfolding of that future I look with anticipation to the happy exchange of ideas between this country and our own.

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CLASSIFICATION OF TREATMENT.

We have found it helpful to establish three broad divisions in graduated exercise for patients sent to us by orthopedic surgeons viz.:

1. A special appliance or muscle-training section.
2. A gymnasium section for higher coördination.
3. An amputation section.

The staffs of these sections form an integral unit, holding case conferences in common to discuss the problems of active exercise and to dovetail the patient's treatment in the respective sections to the best possible advantage.

The special appliance section has separate rooms of large dimension for the upper and the lower extremity. A medical officer is in charge with a specially qualified woman supervisor in each room. The treatment here is entirely individual, and as detailed and specialized as we are able to devise. The prescription is carried out by a corps of full-time volunteer women "trainers" whom we have instructed and of whose capacity in this rôle I cannot speak too favorably.

The gymnasium section is under the able leadership of Capt. H. R. Smith, assisted by a group of sergeant instructors whom he has trained, and a portion of whom have been selected from promising patient material. In the gymnasium patients are grouped according to specific disabilities. The groups range from three to six for most exercises and games, increasing to twelve or more for wand work, foot exercises, or strenuous wrist exercises. The size of groups is determined by the number an instructor can efficiently supervise with due individual attention to the degree of accomplishment. For certain cases, such as tabetics, severe paraplegia, or very tremulous conditions, such as a woman could not well support, individual treatment is given in the gymnasium. We have carefully culled over commercial gymnasium equipment and also built special pieces. From a curative standpoint and in the eyes of a patient there is no essential distinction between gymnasium appliances and the special appliance section referred to above, except the degree of coördination involved. Both are mechanotherapy if either is. For example, practice in a walking frame or a paraplegic perambulator, stepping over hurdles, or footprint and mirror walking, which belong to the leg section, lead naturally to dancing steps with a phonograph or, better, a player-piano in the gymnasium. Or, again, the finger flexion and grasping exercises of the arm room dovetail into the first ball catching and racquet grasping work of the gymnasium. For this reason we have found it advantageous to have patients

treated concurrently in these departments. From this point of view our classification of treatment has been: special appliance work only, 25%; special appliance and gymnasium, 60%; gymnasium only, 15%.

Lastly, corrective exercise for stumps prior to the final fitting of the artificial limb forms a study in itself. There are two chief objectives in this work: (1) To strengthen the atrophied and weakened musculature of the stump and correct the faulty set of flexion or abduction so often found. (2) To restore or, better, prevent the loss of coördination of the member as an active factor in the patient's life. This facilitates a satisfactory fit and prepares the patient to use his new limb instead of hanging it on the wall for the major part of the day. Competitive games, such as tether football or nine-pins for the leg, and badminton, tether tennis or billiards, etc., for the arm, played with special attachments on the stump are very successful. With important modifications, considerable gymnasium technic can be employed beneficially for amputation cases.

PRINCIPLES OF INTENSIVE ACTIVE EXERCISES.

The method described above is intensely curative. As distinct from workshop treatment, which is assumed to be coincident, it assists the patient to understand his specific disability and struggle to master it. Short periods of forty minutes with such rests as the condition requires, and with specialized work preceding the higher coördination, have proved most beneficial.

The mental attitude of the patient is a point of fundamental importance. He must be keen, he must know what is the matter, be convinced not only that it can be improved but that he can improve it. He must be shown how and then encouraged to work with spontaneity. The study of mental attitudes in a hospital population of veterans is a point of no small therapeutic significance. This requires trained officers and assistants. Rarely does the correct attitude and determination exist; it must be created, and that is the first step in successful treatment. Often it can be obtained by a confidential talk; it cannot always be commanded, though severity has its place; frequently it can be cultivated by appliances designed to that end. In any case it is an individual study, and is a matter that must not be neglected if we are to attain the best.

Means which contribute to this end are:

1. An examination by the medical officer of the department to ascertain the exact measure of disability, particularly of movement and of

strength. Care is taken to dissect the disability in the patient's own eyes, showing him where he stands and what he can hope for.

2. A confidential interview of the kind suggested.

3. A prescription of treatment, limited at first and designed to encourage progression to new phases and graduation from old ones.

4. Frequent and somewhat formal reëxaminations for measurement of increase of function, charting these in progress curves, etc.

5. Cultivation of a point of view of self-education, *i.e.*, to show the patient how to treat himself and encourage him to coöperate by doing so on all possible occasions.

PRINCIPLES OF SPECIAL APPLIANCES.

1. From first to last, appliances are only a means to an end. They are a means of assisting functioning under controlled and advantageous conditions. The end is increase in extent of movement, whether free or resistive.

2. Appliances, therefore, must be presented to a patient as secondary, as a temporary assistance, to be discarded as soon as possible. If formidable and highly finished, they tend in the patient's eyes to be indispensable to treatment. We, therefore, leave our pieces unvarnished and keep machine mechanism covered.

3. Similarly, binding or bracing attachments should be reduced to a minimum, as the keeping of correct posture voluntarily is a chief part of active exercise. It is a chief duty of the instructor to urge this on the patient and to encourage and help him in this direction until he can finally dispense with the appliance.

4. The degree of mobilization, free or resistive, being the goal, any feature or arrangement of apparatus which distracts from concentrated effort is disadvantageous. Combination pieces, therefore, do not contribute either to efficiency or capacity, and numerous scales or adjustments on any single piece tend to divide the attention. On the other hand, a variety of distinct pieces for the same function sustains interest and effort. For extent of movement we have found that a visual stimulus, *viz.*, a pointer moving over a radial scale, is better than auditory clicking devices, both because of the continuity of the visual and because noisy apparatus distracts other patients if close at hand. For graduated resistance, after careful experimentation with pendulums, counterbalances, springs and suspended weights, we find that upon the score of range of load, ease and quickness of control,

continuity through a two-way movement, and for mechanical simplicity, a special form of band brake is much to be preferred.

5. Lastly, separate pieces of a portable type that can be used on a deal table, as distinct from a permanent bench arrangement, assist in the required concentration of individual effort and also permit competition when required.

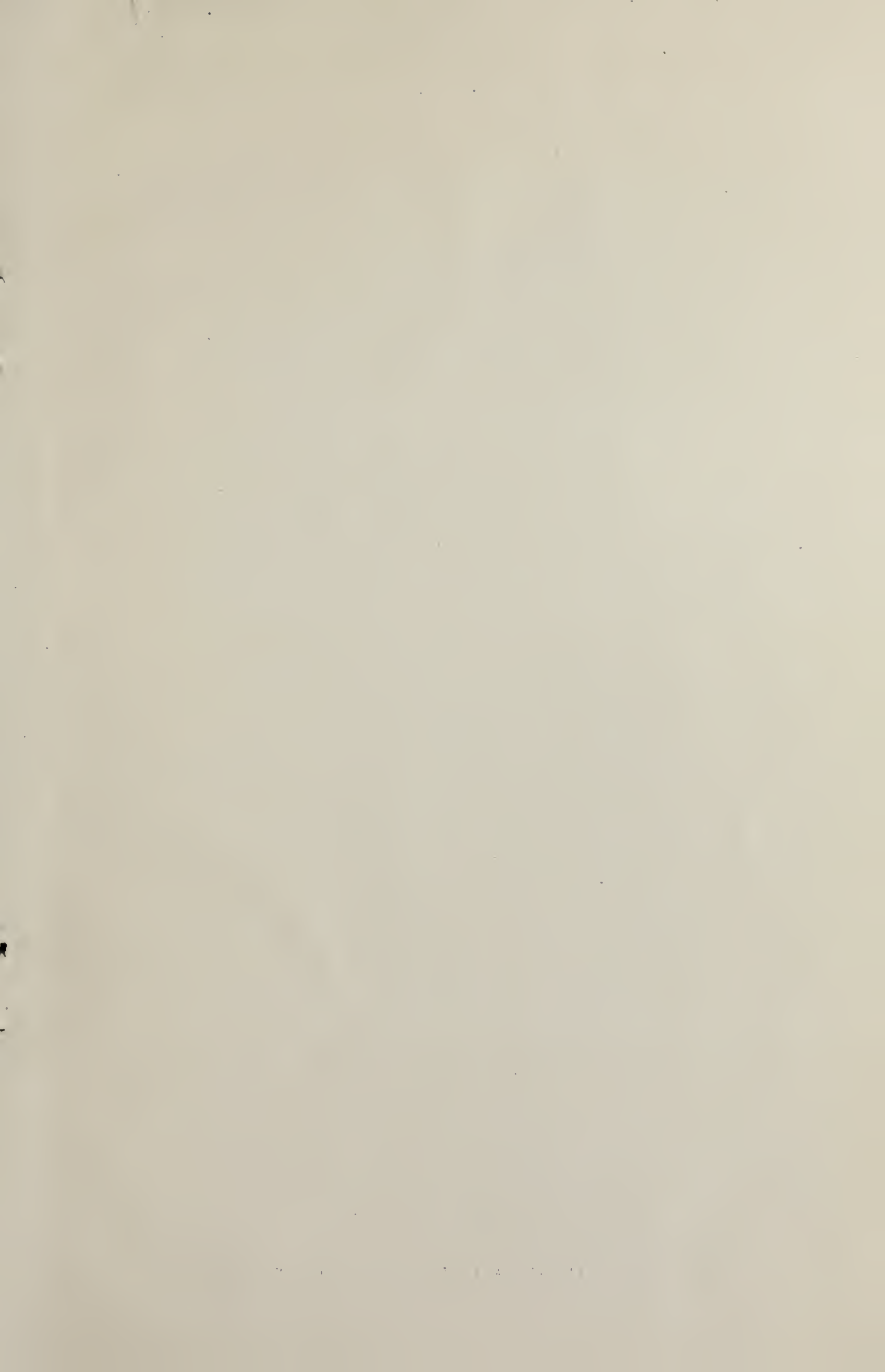
To sum up: Special appliances should be designed for specific functions, and have a metrical indication of range of movement and amount of load. They should be simple, be strongly made, fit well for right or left if possible, and have no loose attachments that may be misplaced.

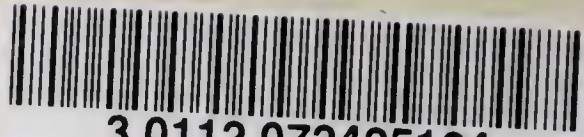
Finally, every phase of war work, reconstructive not less than combative, is driving us to specialization. Mechanotherapy is no exception, but here the specialization must have due regard for the kind and amount of clinical material to be handled. One might put up with a few inefficient appliances or, indeed, with none at all, but neither this nor too highly specialized designs are desirable. A happy medium of design, combining simplicity and durability with a capacity for sustaining spontaneity, will win its proper place in the equipment of orthopedic hospitals—military and civilian. What that place is can perhaps better be decided after further experience. In the meantime the field of experimentation in mechanotherapy should be kept open and provision should be made for instructing a number of capable and conscientious women “trainers” for the work.



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